all notes-click here

embedded system

1. What is break and continue statement?

Break Statement	Continue Statement
The Break statement is used to exit from the loop constructs.	The continue statement is not used to exit from the loop constructs.
The break statement is usually used with the switch statement, and it can also use it within the while loop, do-while loop, or the for-loop.	The continue statement is not used with the switch statement, but it can be used within the while loop, do-while loop, or for-loop.
When a break statement is encountered then the control is exited from the loop construct immediately.	When the continue statement is encountered then the control automatically passed from the beginning of the loop statement.
Syntax: break;	**Syntax:** continue;

2. Differentiate between else if and switch statements with examples.

The nested if...else statement is used when program requires more than one test expression. Syntax of nested if...else statement.	Decision making are needed when, the program encounters the situation to choose a particular statement among many statements. If a programmer has to choose one block of statement among many alternatives, nested if...else can be used but, this makes programming logic complex. This type of problem can be handled in C programming using switch statement

```
int i = 2;
int j = 3;
void setup ( )  {
 Serial.begin(9600);
}
void loop ( )
{
 if ( i > j )  {
  Serial.println( " I is greater ");
 }
 else if ( i < j )  {
  Serial.println( " J is greater " );
 }
 else  {
  Serial.println( " Both are equal " );
 }
}
```

Not a example of arduino

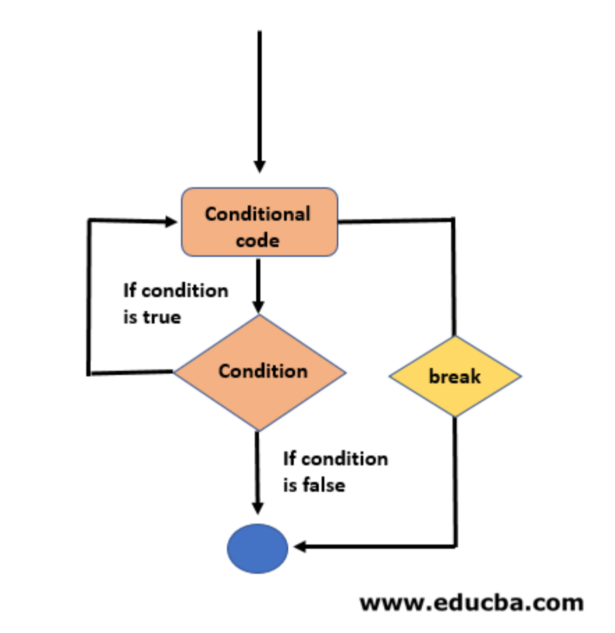
```
#include <stdio.h>
int main(){
   int n;
   scanf("%d",&n);
   switch(n){
      case 1:
         printf("%d is 1",n);
         break;
      case 2:
         printf("%d is 2",n);
         break;
      default:
         printf("%d>2",n);
         break;
   }
   return 0;
}
```

3. What is the Syntax of If statement and for loop?

If statement	For loop

If(condition)
{
    //statement if cond. is true
}
	For((initialization statement; test expr.; update state.)
	{
	        //statements
	}

4. Draw the flowchart of Break and Continue statement.



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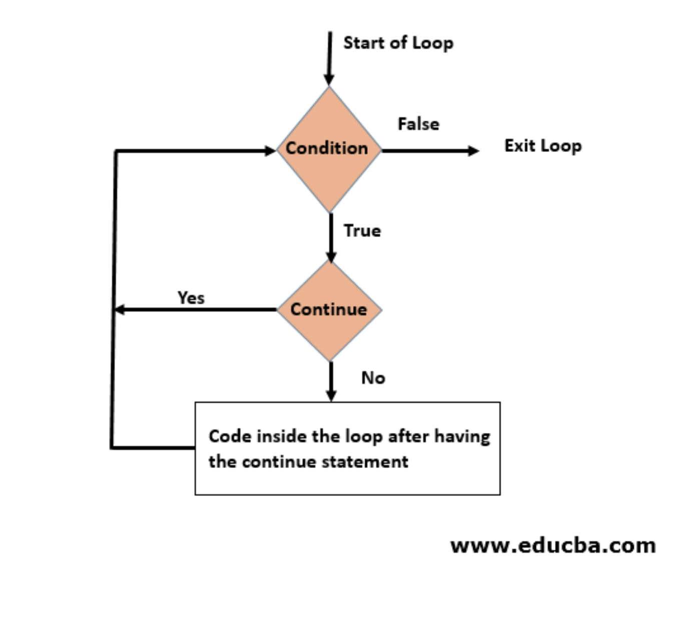

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5. Explain about integrated development environment (IDE).

Integrated development environments (IDE) are applications that facilitates the development of other applications. Designed to encompass all programming tasks in one application, one of the main benefits of an IDE is that they offer a central interface with all the tools a developer needs, including:

- **Code editor:** Designed for writing and editing source code, these editors are distinguished from text editors because work to either simplify or enhance the process of writing and editing of code for developers
- **Compiler:** Compilers transform source code that is written in a human readable/writable language in a form that computers can execute.
- **Debugger:** Debuggers are used during testing and can help developers debug their application programs.

The Benefits of Using IDEs

Integrated development environments work to improve developer productivity. These IDEs improve productivity by lessening setup time, boosting the speed of development tasks, keeping developers up to date with the latest best practices and threats, and standardizing the development process so that everyone can get on board.

example- Visual Studio, MonoDevelop, Xcode, Espresso, Coda

6. Discuss the types of C programming arrays.

In C programming, one of the frequently arising problem is to handle similar types of data.

For example:

If the user want to store marks of 100 students. This can be done by creating 100 variable individually but, this process is rather tedious and impracticable.

These type of problem can be handled in C programming using arrays.

An array is a sequence of data item of homogeneous value(same type).

Arrays are of two types:

1. One-dimensional arrays -int nums[5] = {0, 1, 2, 3, 4};
2. multi-dimensional arrays-

two-dimensional arrays	three-dimensional arrays

int A[2][3] = {3, 2, 1, 8, 9, 10}	int x[2][2][4] =
	{
	{ {0,1,2,3}, {4,5,6,7}, {8,9,10,11} },
	{ {12,13,14,15}}
	};

7. Discuss the three types of loops in C programming.

There are 3 different types of Loops in C:

1.While Loop
2.Do While Loop
3.For Loop

While loop	syntax

The while loop checks whether the test expression is true or not. If it is true, code/s inside the body of while loop is executed,that is, code/s inside the braces { } are executed. Then again the test expression is checked whether test expression is true or not. This process continues until the test expression becomes false	while (condition) {
	statements;
	}

Do while loop	syntax

In C, do...while loop is very similar to while loop. Only difference between these two loops is that, in while loops, test expression is checked at first but, in do...while loop code is executed at first then the condition is checked. So, the code are executed at least once in do...while loops.	do {
	statements
	} while (expression);

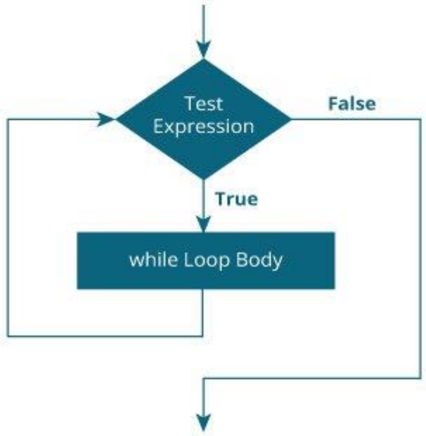
For loop	syntax

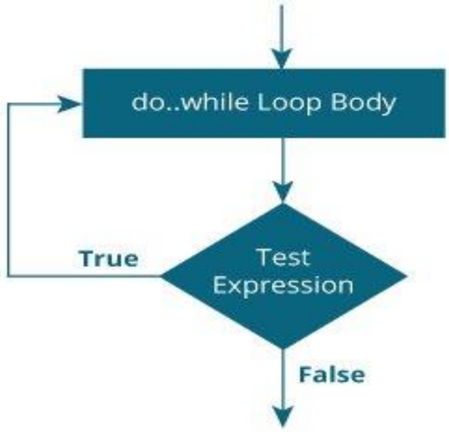
The initialization statement is executed only once at the beginning of the for loop. Then the test expression is checked by the	for (initial value; condition;updation){
	statements;
	}

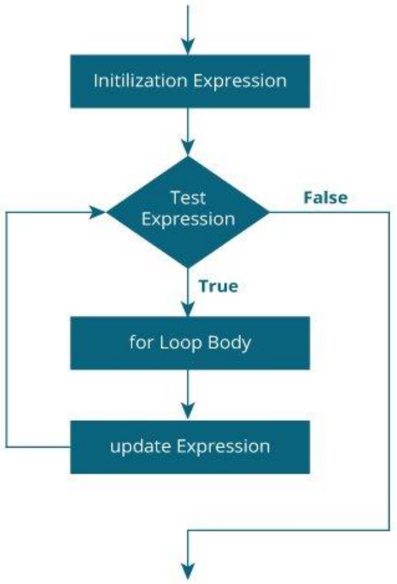
program. If the test expression is false, for loop is terminated. But if test expression is true then the code/s inside body of for loop is executed and then update expression is updated. This process repeats until test expression is false	

or just flowchart

while	syntax

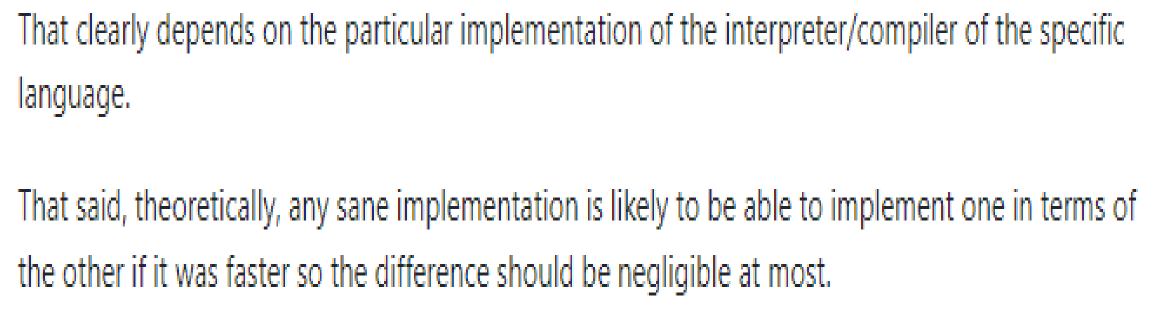
	while (condition) {
	statements;
	}

Do while	syntax
	do { statements } while
For	syntax

 Initilization Expression
Test Expression
False
True
for Loop Body
update Expression
	int i;
	void setup ( )
	{
	Serial.begin(9600);
	for (i = 0 ; i < 15 ; i ++)
	{
	Serial.println("Arduino");
	}
	}
	void loop ( ) {
	}

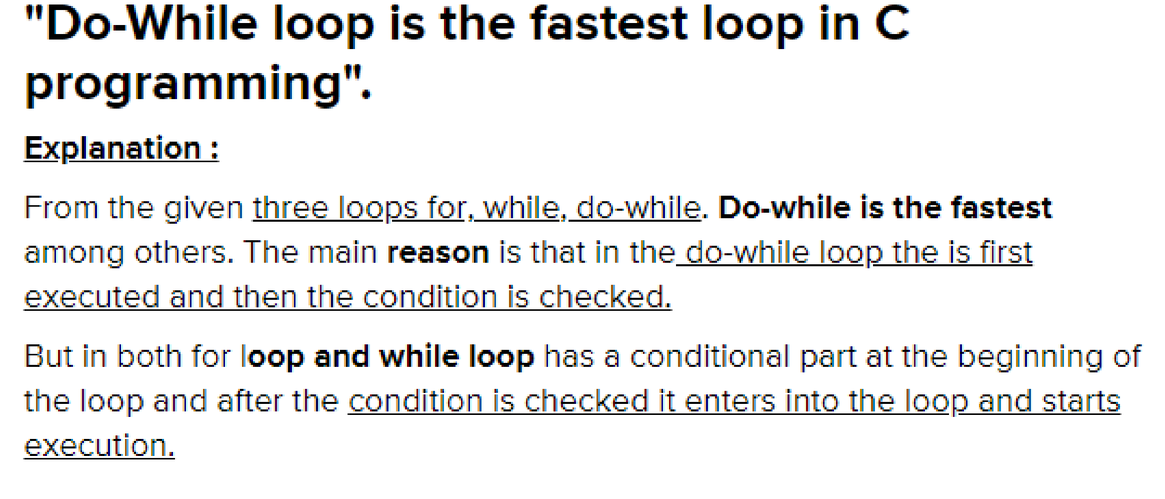
8. Which loop is faster in C Language: for, while or Do While? Discuss how 'for loop' works in C programming?

**for first part I didn't find a proper answer



That clearly depends on the particular implementation of the interpreter/compiler of the specific language.

That said, theoretically, any sane implementation is likely to be able to implement one in terms of the other if it was faster so the difference should be negligible at most.

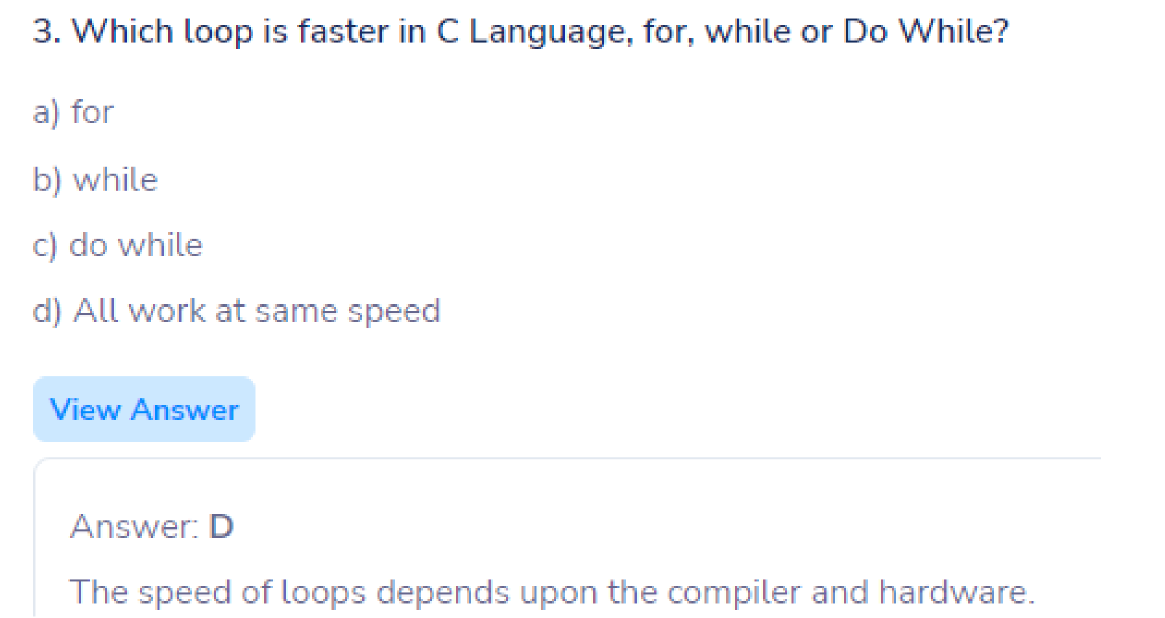


"Do-While loop is the fastest loop in C programming".

Explanation :

From the given three loops for, while, do-while. **Do-while is the fastest** among others. The main **reason** is that in the do-while loop the is first executed and then the condition is checked.

But in both for l**oop and while loop** has a conditional part at the beginning of the loop and after the condition is checked it enters into the loop and starts execution.



3. Which loop is faster in C Language, for, while or Do While?

a) for

b) while

c) do while

d) All work at same speed

Answer: D

The speed of loops depends upon the compiler and hardware.

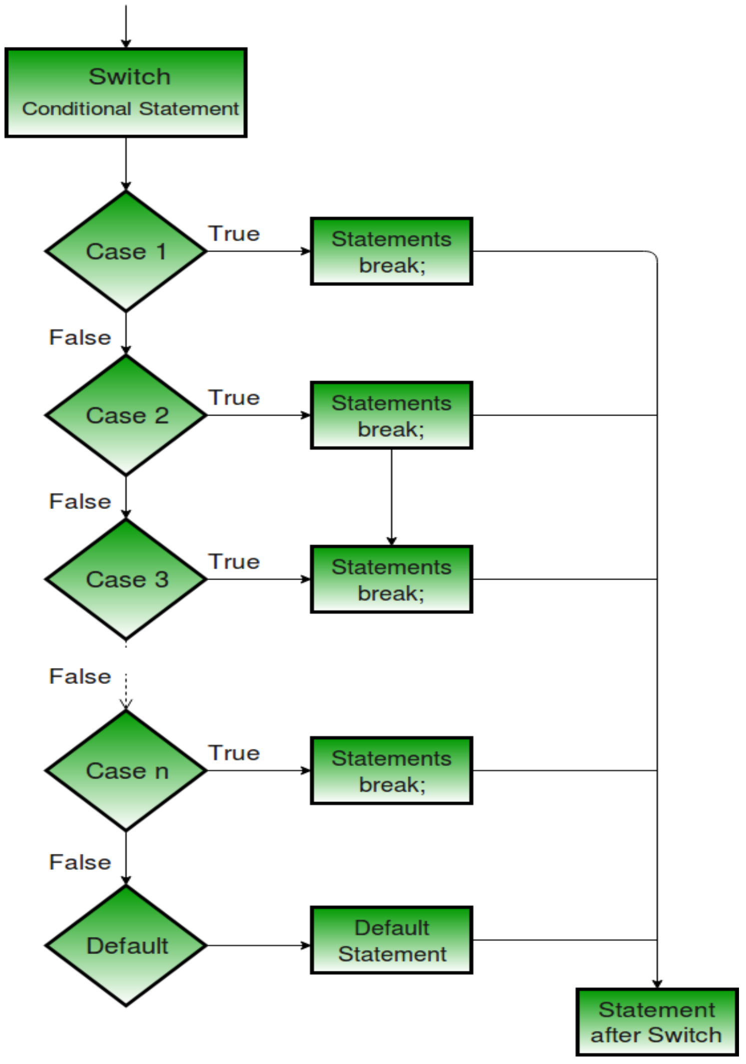
** for 2nd part refer to question 7(for part)

9. Draw and explain block diagram of switch case statement in ‘C’ programming.

Decision making are needed when, the program encounters the situation to choose a particular statement among many statements.

If a programmer has to choose one block of statement among many alternatives, nested if...else can be used but, this makes programming logic complex.

This type of problem can be handled in C programming using switch statement



1) The expression provided in the switch should result in a constant value otherwise it would not be valid.

2) Duplicate case values are not allowed.

3) The default statement is optional. Even if the switch case statement do not have a default statement,
it would run without any problem.

4) The break statement is used inside the switch to terminate a statement sequence. When a break statement is reached, the switch terminates, and the flow of control jumps to the next line following the switch statement.

5) The break statement is optional. If omitted, execution will continue on into the next case. The flow of control will fall through to subsequent cases until a break is reached.

6) Nesting of switch statements is allowed, which means you can have switch statements inside another switch. However nested switch statements should be avoided as it makes the program more complex and less readable.

7) Switch statements are limited to integer values only in the check condition.

10.Give the points of similarity and differences between a while loop and a do while loop. Also mention the syntax for both loops.

difference between While and Do While Loop:

While	Do While
It checks the condition first and then executes statement(s)	This loop will execute the statement(s) at least once, then the condition is checked.
While loop allows initialization of counter variables before starting the body of a loop.	Do while loop allows initialization of counter variables before and after starting the body of a loop.
It is an entry controlled loop.	It is an exit controlled loop.
We do not need to add a semicolon at the end of a while condition.	We need to add a semicolon at the end of the while condition.
In case of a single statement, we do need to add brackets.	Brackets are always needed.
In this loop, the condition is mentioned at the starting of the loop.	The loop condition is specified after the block is executed.
Statement(s) can be executed zero times if the condition is false.	Statement is executed at least once.

Generally while loop is written as:
`while (condition) {`
`Statements; // loop body`
`}`
	Generally do while loop is written as:
	`do{`
	`Statements; //loop body`
	`} while (condition);`

Similarities:

i. Both are used for executing a set of instructions repeatedly.

ii. Both evaluate a logical condition for terminating the loop

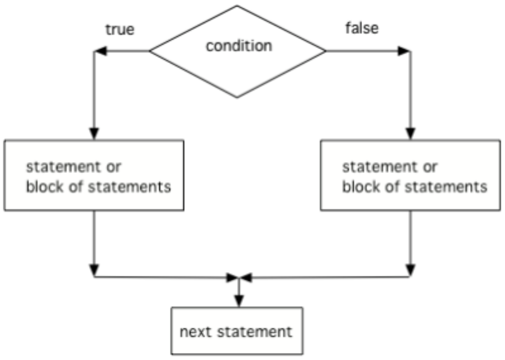
iii. Both can be made to get into an infinite loop

iv. Both looping statements can be used interchangeably (with a little change depending on the condition)

11.Differentiate between Two Way Selection and Multiway Selection with proper syntax,flowchart and suitable example.

Two Way Selection

The two-way selection is the basic decision statement for computers. The decision is based on resolving a binary expression, and then executing a set of commands depending on whether the response was true or false. C, like most contemporary programming languages, implements two-way selection with the if…else statement. An if…else statement is a paired statement used to selectively execute code based on two alternatives


true
condition
false
statement or block of statements
statement or block of statements
next statement

```
if (boolean expression){
    statement1;
    statement2;
}
else{
   do other statement;
   and another one;
}
```

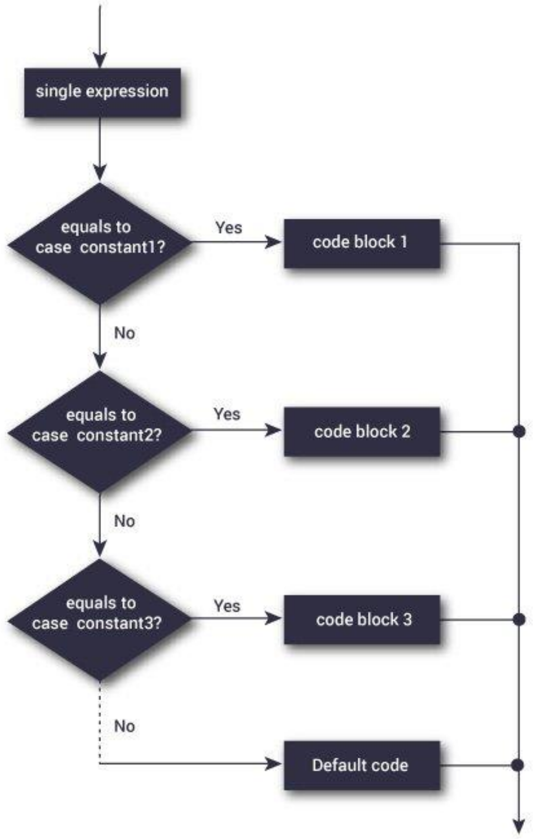
For example refer to ques. 2

Multiway Selection:switch statement

A multi-way selection statement is used to execute **at most ONE** of the choices of a set of statements presented

syntax

```
switch (expression)
{
   case constant1:
     // statements
     break;

   case constant2:
     // statements
     break;
   .
   .
   .
   default:
     // default statements
}
```



For example refer to ques. 2

12.With an example sketch, explain multidimensional array.

Multidimentional arrays:

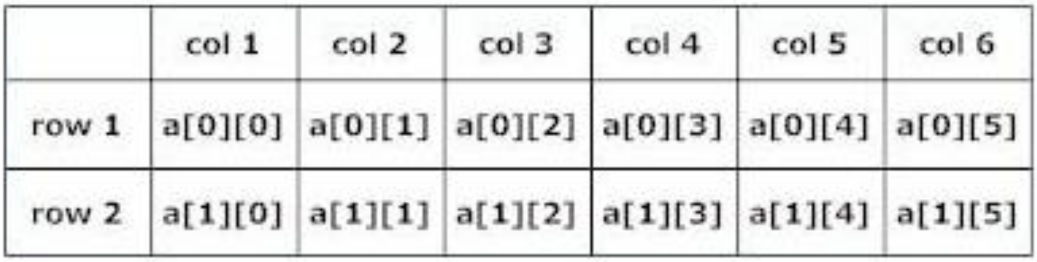
C programming language allows programmer to create arrays of arrays known as multidimensional arrays.

For example:

float a[2][6]; Here, a is an array of two dimension, which is an example of multidimensional array.

For better understanding of multidimensional arrays, array elements of above example can be

thinked of as below:



	col 1	col 2	col 3	col 4	col 5	col 6
row 1	a[0][0]	a[0][1]	a[0][2]	a[0][3]	a[0][4]	a[0][5]
row 2	a[1][0]	a[1][1]	a[1][2]	a[1][3]	a[1][4]	a[1][5]

Figure: Multidimensional Arrays

Initialization of Multidimensional Arrays

In C, multidimensional arrays can be initialized in different number of ways.

```
int c[2][3]={{1,3,0}, {-1,5,9}};
```

OR

```
int c[][3]={{1,3,0}, {-1,5,9}};
```

OR

```
int c[2][3]={1,3,0,-1,5,9};
```

Unit 3

1. Write a program to turn LED on for 1sec and off for 3sec.

code

```
void setup() {
  // put your setup code here, to run once:
  pinMode(13,OUTPUT);

}

void loop() {
  // put your main code here, to run repeatedly:
  digitalWrite(13,HIGH);
  delay(1000);
  digitalWrite(13,LOW);
  delay(3000);


}
```

2. Elaborate the following functions: (i) analogRead() and (ii) delayMicroseconds()

analogRead()	delayMicroseconds()
Reads the value from the specified analog pin. Arduino boards contain a multichannel, 10-bit analog to digital converter. This means that it will map input voltages between 0 and the operating voltage(5V or 3.3V) into integer values between 0 and 1023 BOARD -Uno OPERATING VOLTAGE-5 Volts USABLE PINS- A0 to A5 MAX RESOLUTION -10 bits	Pauses the program for the amount of time (in microseconds) specified by the parameter. There are a thousand microseconds in a millisecond and a million microseconds in a second. Currently, the largest value that will produce an accurate delay is 16383; larger values can produce an extremely short delay. This could change in future Arduino releases. For delays longer than a few thousand microseconds, you should use delay() instead.

int analogPin = A3;
int val = 0;
void setup() {
    Serial.begin(9600);
}
void loop() {
    val = analogRead(analogPin);
    Serial.println(val);
}
	int outPin = 8;
	void setup() {
	  pinMode(outPin, OUTPUT);
	}
	void loop() {
	  digitalWrite(outPin, HIGH);
	  delayMicroseconds(50);
	  digitalWrite(outPin, LOW);
	  delayMicroseconds(50);
	}

3. Discuss the features of Keil Compiler.

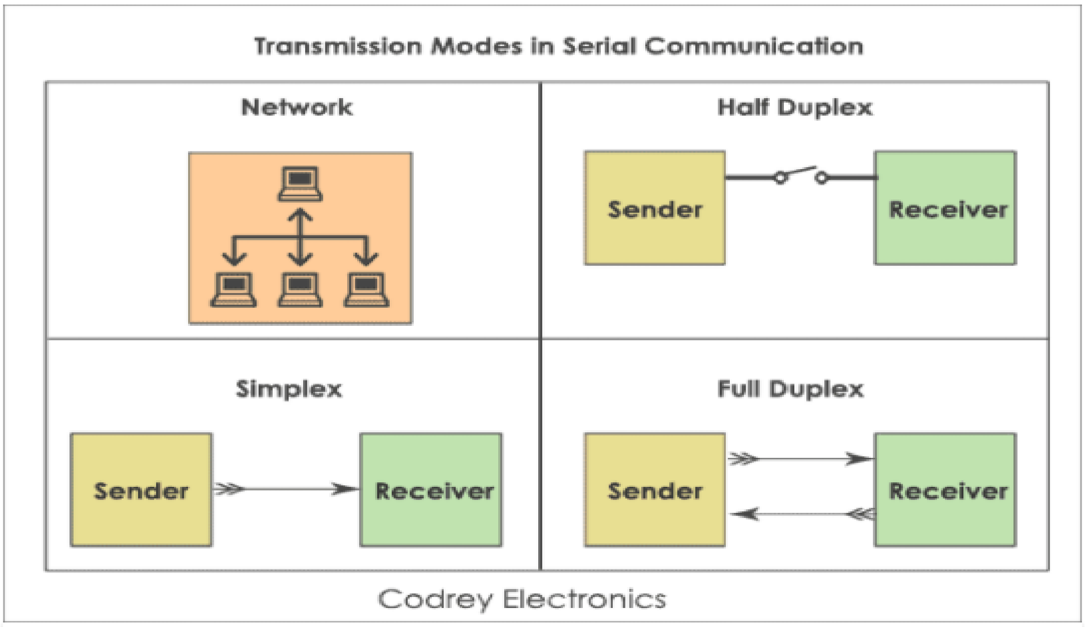
about	features
The Keil C51 C Compiler for the 8051 microcontroller is the most popular 8051 C compiler in the world. It provides more features than any other 8051 C compiler available today. The C51 Compiler allows you to write 8051 microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the C51 Compiler give you full access to all resources of the 8051. The C51 Compiler translates C source files into relocatable object modules which contain full symbolic information for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference information.	Nine basic data types, including 32-bit IEEE floating-point, Flexible variable allocation with bit, data, bdata, idata, xdata, and pdata memory types Interrupt functions may be written in C, Full use of the 8051 register banks, Complete symbol and type information for source-level debugging, Use of AJMP and ACALL instructions, Bit-addressable data objects, Built-in interface for the RTX51 Real-Time Kernel, Support for dual data pointers on Atmel, AMD, Cypress, Dallas Semiconductor, Infineon, Philips, and Triscend microcontrollers, Support for the Philips 8xC750, 8xC751, and 8xC752 limited instruction sets, Support for the Infineon 80C517 arithmetic unit.

4. What is serial communication? Discuss the different transmission modes in serialcommunication.

Serial communication is the most widely used approach to transfer information between data processing equipment and peripherals. In general, communication means interchange of information between individuals through written documents, verbal words, audio and video lessons.

In embedded system, Serial communication is the way of exchanging data using different methods in the form of serial digital binary. Some of the well-known interfaces used for the data exchange are RS-232, RS-485, I2C, SPI etc.

Serial communication can take many forms depending on the type of transmission mode and data transfer. The **transmission modes** are classified as Simplex, Half Duplex, and Full Duplex. There will be a source (also known as a *sender)* and destination (also called *a receiver*) for each transmission mode.



Transmission Modes – Serial Communication

The **Simplex method** is a one-way communication technique. Only one client (either the sender or receiver is active at a time). If a sender transmits, the receiver can only accept. Radio and Television transmission are the examples of simplex mode.

In **Half Duplex mode**, both sender and receiver are active but not at a time, i.e. if a sender transmits, the receiver can accept but cannot send and vice versa. A good example is an internet. If a client (laptop) sends a request for a web page, the web server processes the application and sends back the information.

The **Full Duplex mode** is widely used communication in the world. Here both sender and receiver can transmit and receive at the same time. An example is your smartphone.

5. What is a sensor? Discuss the different types of sensors and their applications.

What is a Sensor?

A device that detects the changes in electrical or physical or other quantities and thereby produces an output as an acknowledgement of change in the quantity is called as a Sensor. Generally, this sensor output will be in the form of electrical or optical signal

Speed Sensor

we can change the speed of all motors using this technology

Temperature Sensor

LCD is used to display temperature in the range of -55degress to +125degrees

PIR Sensor

Automatic Door Opening System is a typical application of PIR sensors which is intended for automatic door closing and opening operations based on body movement near the door

Ultrasonic Sensor

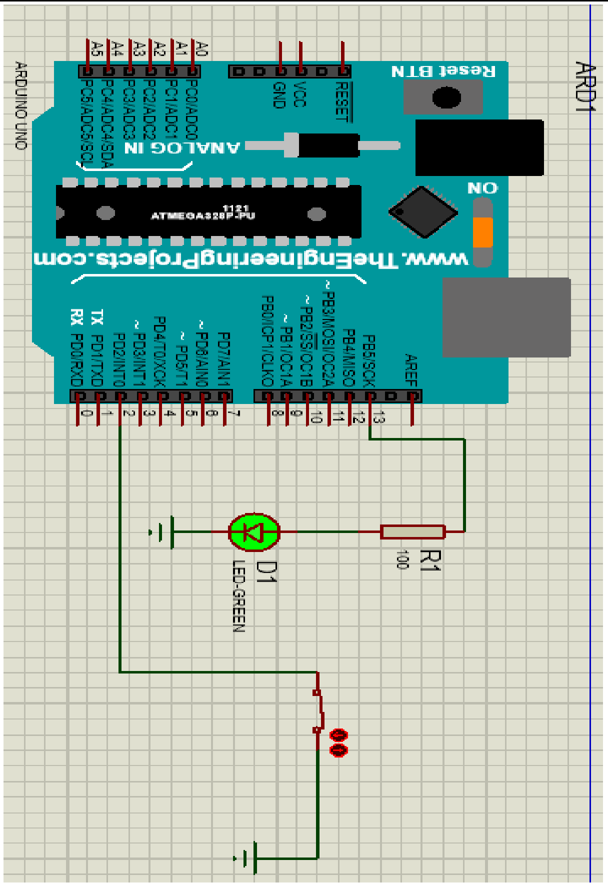
The distance measurement at inaccessible areas is a typical application of ultrasonic sensors

6. Write a program to make switch operated LED light and draw the proteus diagram for thesame.

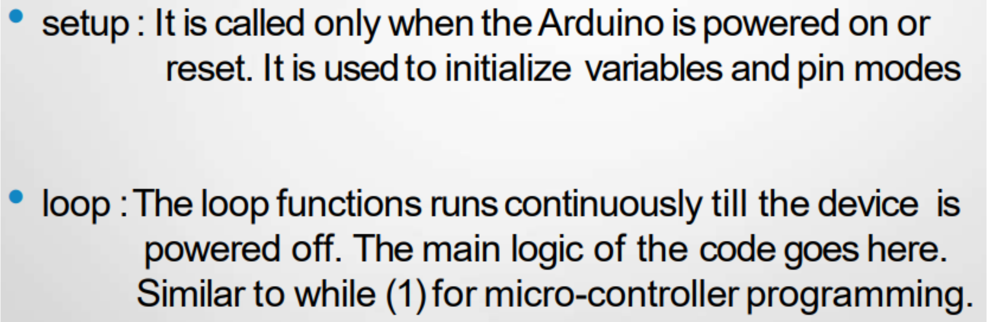
code

```
int switchPin=2;
int ledPin=13;
void setup() {
  pinMode(ledPin,OUTPUT);
  pinMode(switchPin,INPUT);
}

void loop() {
  if(digitalRead(switchPin)==HIGH){
     digitalWrite(ledPin,HIGH);
  }
  else{
    digitalWrite(ledPin,LOW);
  }

}
```

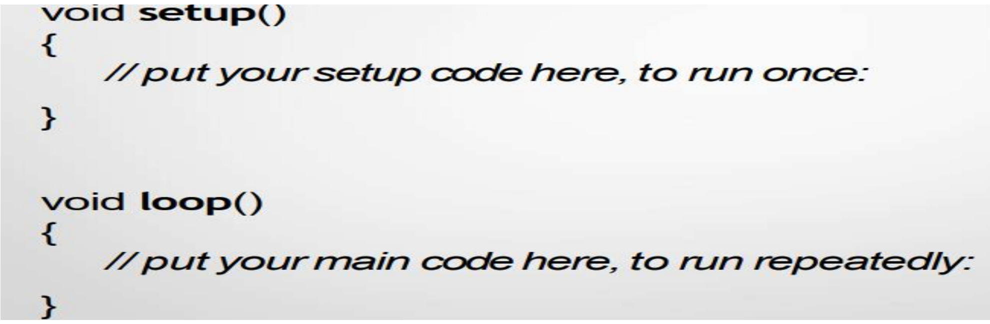
diagram



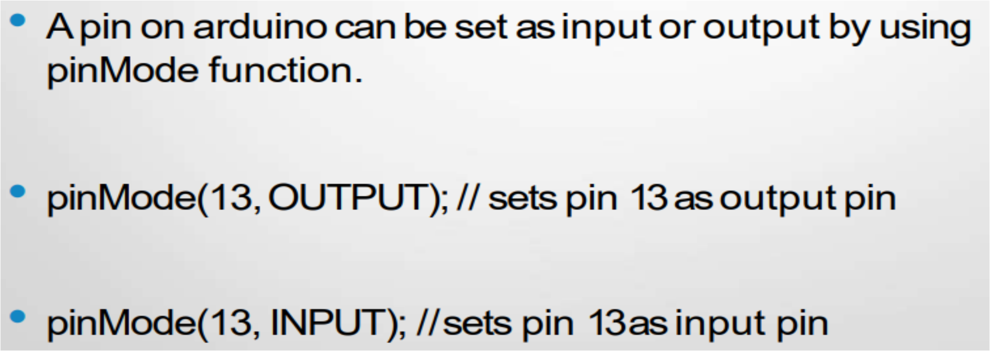
7. Discuss the basic commands and Functions for Arduino programming with proper syntax.



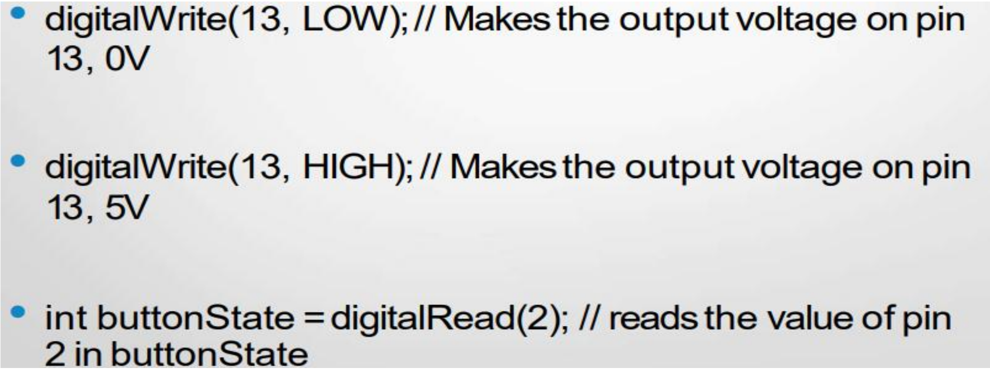
- setup : It is called only when the Arduino is powered on or reset. It is used to initialize variables and pin modes
- loop : The loop functions runs continuously till the device is powered off. The main logic of the code goes here. Similar to while (1) for micro-controller programming.



```
void setup()
{
    // put your setup code here, to run once:
}

void loop()
{
    // put your main code here, to run repeatedly:
}
```



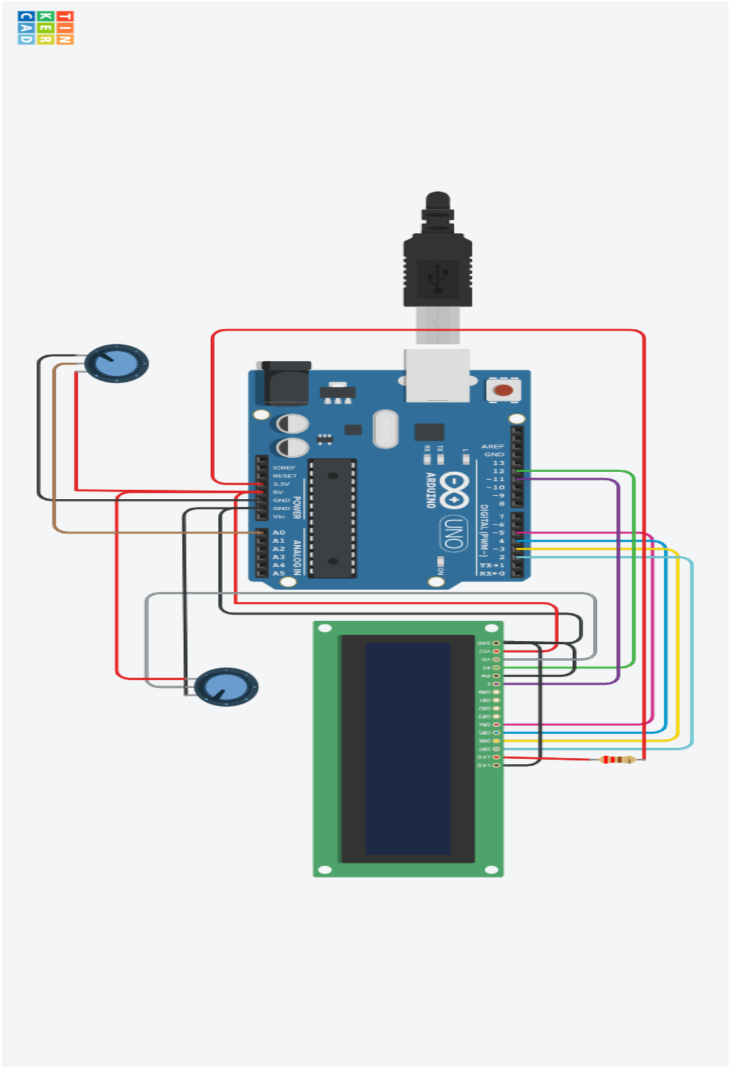
- A pin on arduino can be set as input or output by using pinMode function.
- pinMode(13, OUTPUT); // sets pin 13 as output pin
- pinMode(13, INPUT); //sets pin 13as input pin



- digitalWrite(13, LOW); // Makes the output voltage on pin 13, 0V
- digitalWrite(13, HIGH); // Makes the output voltage on pin 13, 5V
- int buttonState = digitalRead(2); // reads the value of pin 2 in buttonState

8. Develop the coding for arduino interfacing with LCD 2x16.

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup() {

 lcd.begin(16, 2);

}

void loop() {


  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Hello Hackster");
  lcd.setCursor(0, 1);
  lcd.print("Value : ");
  lcd.setCursor(10, 1);
  lcd.print(analogRead(A0));

Serial.println(analogRead(A0));
delay(500);
}
```



Single Turn Potentiometer- 10k ohms
Resistor 220 ohm
16x2 LCD
Arduino UNO

** to understand the code better click here-link or link